

Africa RISING

Transforming African agriculture through sustainable intensification

Putting healthy maize cobs into farmers' hands: A young farmer in north-eastern Tanzania admires a harvest-ready maize cob on a project demonstration plot.
Photo credit: Gloriana Ndiralema/IITA.

The Africa Research in Sustainable Intensification for the Next Generation (Africa RISING) program comprises three regional research-in-development projects supported by the United States Agency for International Development as part of the US Government's Feed the Future initiative. Inaugurated in late 2011, and currently in its second phase (since September 2016), the purpose of Africa RISING is to provide pathways out of hunger and poverty for smallholder farm families through sustainably intensified farming systems that sufficiently improve food, nutrition, and income security, particularly for women and children, and conserve or enhance the natural resource base.

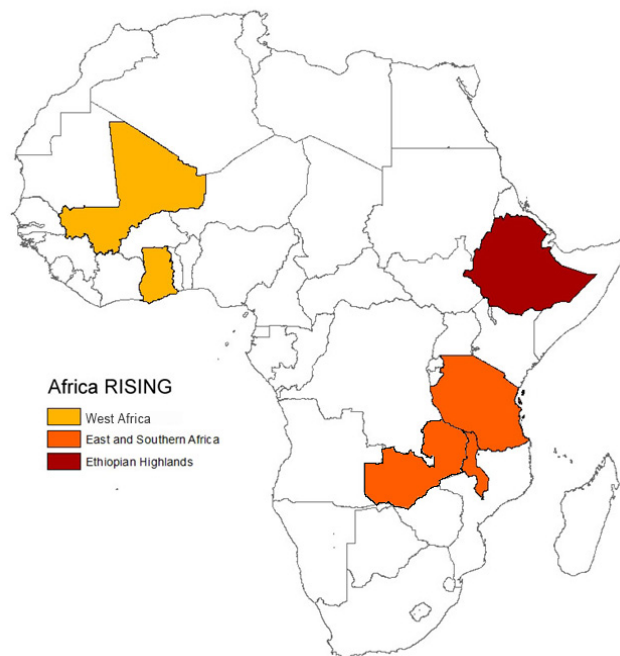
The three regional projects are:

- Africa RISING East and Southern Africa Project (Sustainable intensification of cereal–legume–livestock integrated farming systems in East and Southern Africa). Implemented in Tanzania, Malawi, and Zambia, led by the International Institute of Tropical Agriculture (IITA).
- Africa RISING Ethiopian Highlands Project (Sustainable intensification of crop–livestock systems to improve food security and farm income diversification in the Ethiopian highlands). Led by the International Livestock Research Institute (ILRI).
- Africa RISING West Africa Project (Sustainable Intensification of Key Farming Systems in the Guinea-Sudano Sahelian Zone of West Africa). Implemented in Ghana and Mali, led IITA.

The International Food Policy Research Institute (IFPRI) is responsible for data management, evaluation, and impact assessment across all three projects.

The program's focus is on sustainable intensification of production from small-scale, crop–livestock farming systems, through integrated multidisciplinary research to deliver a basket of technological innovations that will be disseminated to farmers through complementary development partnerships. The demand-driven research ensures that the program's outputs are ultimately scaled to receptive and informed beneficiary households.

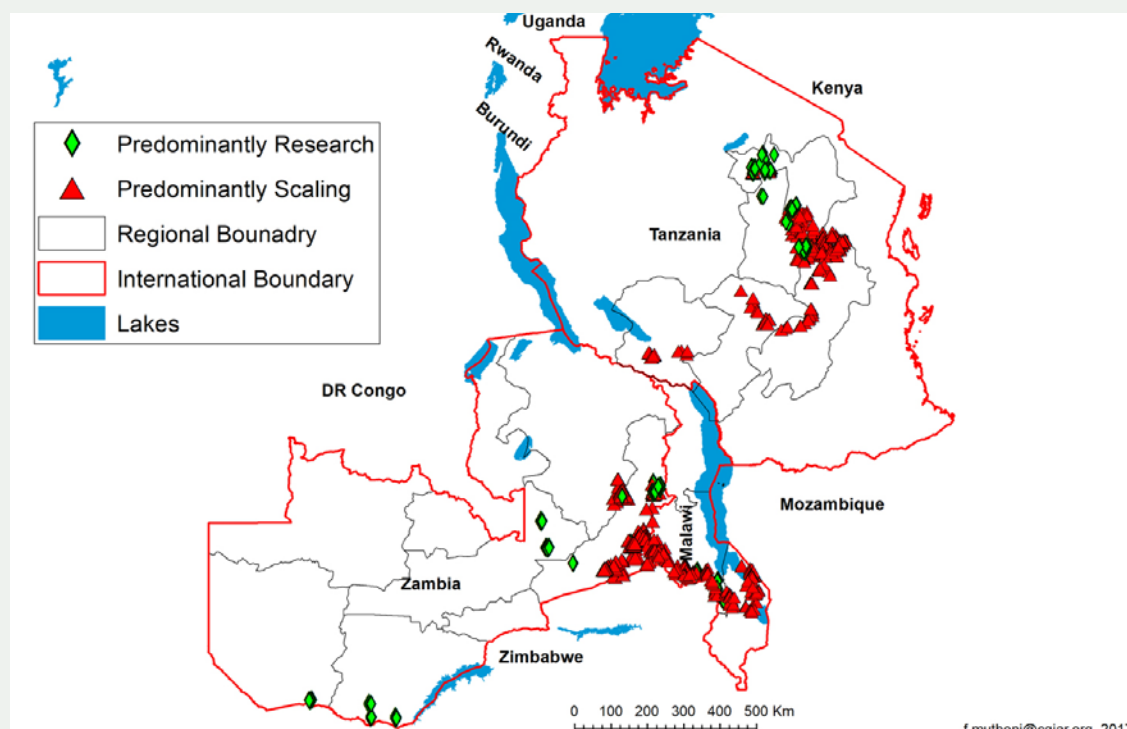
Implementing partners are drawn from international and national agricultural research and extension systems, development



Africa RISING program countries.

organizations, farmers, community-based organizations, and input/output dealers. Guided by the farming systems, national priorities, and the household typologies identified during Phase 1, the program aims to scale Africa RISING innovations to at least 1.1 million households by 2021. The evidence base generated through this widespread dissemination will help catalyze further partnerships that will put the promising technologies and integrated interventions into the hands of millions of rural people in Africa.

The Africa RISING East and Southern Africa Project



Project intervention sites. Scaling and research activities are being implemented in 12 districts in Tanzania (Babati, Kiteto, Kongwa, Kilombero, Ifakara, Kilosa, Mvomero, Iringa Rural, Kilolo, Mbarali, Mbeya Rural, and Mbozi); five districts in Malawi (Dedza, Ntcheu, Mchinji, Lilongwe Rural, and Mangochi); and eight districts in Zambia (Chipata, Lundazi, Petauke, Katete, Sinda, Sesheke, Kasungula, and Serenje).

The Africa RISING East and Southern Africa Project is implemented in the maize-dominated cereal–legume farming systems of Tanzania, Malawi, and Zambia. In Phase 1 (2011–2016) the project implemented research activities aimed at establishing best-bet technologies that would deliver adoptable development solutions to smallholder farm families. Phase 2 of the project (2016–2021) will combine continuity with evolutionary change to ensure that the technologies identified in Phase 1 drive wider adoption at scale through effective co-working with tangible development partnerships. The project envisions that, by 2021, at least 300,000 smallholder farm households will have had access to Africa RISING technologies.

Based on the experiences and lessons learned from Phase 1, the expected outcomes of the Africa RISING East and Southern Africa

project in Phase 2 are:

- **Outcome 1:** Productivity, diversity, and income of crop–livestock systems in selected agroecologies enhanced under climate variability.
- **Outcome 2:** Natural resource integrity and resilience to climate change enhanced for the target communities and agroecologies.
- **Outcome 3:** Food and feed safety, nutritional quality, and income security of target smallholder families improved equitably (within households).
- **Outcome 4:** Functionality of input and output markets and other institutions to deliver demand-driven sustainable intensification research products improved.
- **Outcome 5:** Partnerships for the scaling of sustainable intensification research products and innovations operationalized.

Characteristics and challenges of the East and Southern Africa farming systems

A number of key challenges affect agricultural productivity in East and Southern Africa. The region is dominated by small-scale, resource-poor farmers whose livelihoods depend on rain-fed crop, livestock, and crop–livestock farming systems. The main staple crops are cereals (maize, sorghum, millet, rice) and legumes (groundnut, beans, cowpea, soybean, pigeon pea). Livestock are mainly cattle, poultry, and small ruminants.

These enterprises operate in diverse agroecological zones in the three countries and are characterized by land degradation, with the arid and semi-arid areas exhibiting the highest levels of soil loss. The soils in the region are also inherently poor in terms of fertility making this a leading biophysical cause of low agricultural productivity. The situation is further compounded by low use of mineral fertilizers and organic amendments. For example, in Babati District of Tanzania, Africa RISING studies established that at least 52% of the fields had negative nutrient balances yet only about 3% of the households use mineral fertilizers.

Livestock offer an opportunity for improving security in food, nutrition, and income. However, productivity is low due to shortages in quality feed, expensive and thus unaffordable commercial feeds for many farmers, and inappropriate husbandry (feeding, health care, housing) practices. Local breeds dominate the livestock enterprise.

In general, the crop and livestock enterprises are weakly integrated for mutual enhancement and synergistic benefits to the farmers.

According to the World Resources Institute, approximately 23% of the available food in sub-Saharan Africa is lost or wasted. This is equal to the

loss of 545 kilocalories per person a day across a subcontinent where 24.8% of the population is undernourished. In addition to this massive food loss, mycotoxin contamination is equally a challenge caused and/or increased by poor handling of the produce and processing during storage. It was established during Phase 1 that in a maize-based farming system in the semi-arid areas of Central and Northern Tanzania, quantitative pre- and postharvest losses of economic importance occur in the field (15%), during processing (13–20%), and during storage (15–25%).

The diets of most rural, poor farm families are often dominated by the intake of basic staple foods (e.g., maize, rice, millet, and sorghum) which are usually deficient in micronutrients such as vitamin A, iron, and zinc needed to prevent malnutrition. The nutritional status of most farm household members, especially pregnant women, breastfeeding mothers, and children below 24 months of age, is therefore poor, leading to chronic malnutrition. For example, stunting for the new born exceeds 15% in Tanzania.

Farmers have limited access to input and output markets and enabling institutions and policies are lacking. Due to inadequacies of traditional promotional and scaling-up/out pathways, there is a large unmet demand for information about improved agricultural technologies and for access to the technologies themselves, especially by women. This has led to low adoption of improved technologies and best practices to reduce food and nutrition insecurity, poverty, and natural resource degradation.

Project interventions



Pigeon pea and groundnut doubled-up legumes intercropping system in Malawi. This system has "double" legume grain and "double" soil fertility benefits from biological N₂-fixation. The most successful doubled-up legume intercropping system involves pigeon pea intercropped with groundnut in an additive design, with little intra-specific competition. Photo credit: Jim Richards/National Geographic.

Through a participatory and demand-driven approach to research, project partners are implementing adaptive research on various technologies and working with development organizations to get them into the hands of farmers at scale. The activities include testing and disseminating: (i) improved crop varieties (drought and *Striga* resistant food and feed crops); (ii) appropriate agronomic practices (planting density, cereal–legume rotations and intercropping, multiple cropping, increasing cropping cycles within a season, efficient use of input resources and agroforestry); (iii) climate-smart land management practices (conservation agriculture, physical barriers to soil and water loss, *in-situ* water harvesting, and soil cover crops); (iv) improved animal husbandry practices (semi-intensive and intensive management); and (v) technologies for reducing pre- and postharvest losses. The project also facilitates linkages between farmers and input/output markets. The objective is to build well-integrated and productive crop and livestock enterprises that minimize natural resource degradation.



A vegetable farmer holds a freshly harvested cabbage from his farm. By incorporating vegetable crops into maize-based systems, the Africa RISING project aims to ensure that nutritional and dietary diversification for smallholder farm families is increased while at the same time enhancing resilience of smallholder families' production systems. Photo Credit: Inviolante Dominick/WorldVeg.

To diversify household nutrition, the project is introducing new nutritious food preparation techniques based on locally available ingredients for household members, particularly children. Nutrition field schools are being used to promote knowledge exchange on best practices for processing and storage of cereals, legumes, and vegetable-based foods.

Group and individual trainings are conducted to strengthen the capacities of all actors (farmers, research and extension staff, input and output dealers, and policy makers). Academic training at the MSc and PhD level is applied to address important knowledge gaps, and to develop the "next" generation of scientists. Information exchange is being promoted through field days, radio programs, exchange visits, and video shows.

The project gives special attention to gender equality and underprivileged groups within the society. Enabling policies and institutions to improve access to input and output markets, formation of effective partnerships, and access to knowledge and information are advocated for, especially through operational level R4D/Innovation platforms.

Innovative scaling pathways



In Eastern Zambia, Africa RISING is partnering with the private sector to make high quality legume seeds accessible to smallholder farmers. The focus legumes are: cowpea, pigeon pea, soybean, and groundnut. Breeder seed produced from a plot like this one is passed to private producers of foundation seed who then feed it to a network of certified seed producers that include seed companies and community-based seed outgrower schemes. Photo credit: Jonathan Odhong/IITA.

Scaling of validated technologies to smallholder farm households by working through innovative partnerships is at the core of the Africa RISING East and Southern Africa project strategy. Through three sub-projects funded by respective USAID country missions in Tanzania, Malawi, and Zambia, improved agricultural technologies are disseminated to farmers and adaptive research informed by the development partners is implemented by scientists to achieve the project's scaling targets and livelihood improvement goals. This new paradigm is called Research in Development (R-in-D).

Africa RISING-NAFAKA scaling project (Tanzania)

The Africa RISING-NAFAKA scaling project (Enhancing partnership among Africa RISING, NAFAKA, and TUBORESHE CHAKULA Programs for fast tracking delivery and scaling of agricultural technologies in Tanzania) is an interdisciplinary and inter-institutional project that aims to address smallholder farmers' needs in the semi-arid and subhumid zones of Tanzania. The project is funded by the USAID Country Mission as part of the US Government's Feed the Future Initiative.

Through participatory on-farm approaches, candidate technologies validated by Africa RISING are being scaled. This is achieved through the networks already established by Tanzania Staples Value Chain (NAFAKA) and other institutional grassroots organizations, creating an opportunity for mainstreaming into wider rural development programs, beyond Africa RISING's original intervention sites.

INVC Bridging Activity (Malawi)

The INVC Bridging Activity is a two-year project funded by the USAID Country Mission. It is a relay project/activity between the Integrating Nutrition in Value Chains (INVC) 1 Project which came to an end in October 2016 and its successor project, Malawi Agricultural Diversification Activity (AgDIV). The Bridging Activity was commissioned with the objective of ensuring that the gains achieved by the INVC 1 project are not lost in between the transition phase from INVC 1 to Ag. Div. It therefore carries on with the implementation of some of the actions implemented under INVC 1. Specifically, the Bridging Activity provides continuity in assistance to a subset of smallholder farmer groups and Extension Planning Areas that received services from INVC 1. It also includes the latest research findings from the Africa RISING project to further boost production of the activity beneficiaries.

Africa RISING going to scale in the Eastern Province of Zambia

The project aims to stimulate the commercialization and distribution of improved legume seeds, contribute to increased frequency of intake of vitamin A through orange-fleshed sweet potato consumption, especially by women and children under 5 years, sustainably intensify current maize-based, low input production systems; and commercialize the Aflasafe biocontrol products for aflatoxin mitigation.



Africa RISING trials and demonstrations offer observable differences for farmers. In this photo an Africa RISING partner in Zambia demonstrates the difference in growth of maize under conservation agriculture promoted by the project and conventional ridge tillage. Photo credit: Christian Thierfelder/CIMMYT.

Technologies validated by the project during Phase I

Broad category	Validated flagship technologies	Validation sites
Genetic integration involving introduction of new crops and varieties to overcome existing biotic and abiotic stresses	Drought-tolerant maize, groundnut, bambara nut, millet, sorghum	Tanzania (Kongwa and Kiteto districts)
	Climbing bean	Tanzania (Babati District) and Malawi (Dedza District)
	Short-duration pigeon pea	Malawi (Dedza and Ntcheu districts)
Manipulation of crop ecologies to get more crops on limited land and maximize biological nitrogen fixation	Doubled-up food legumes	Malawi (Dedza and Ntcheu districts), Zambia (Sinda, Chipata, and Lundazi)
	Doubled-up food and fodder legumes	Tanzania (Kongwa and Kiteto districts)
	Cereal-legume intercropping, crop rotations	All project sites
Integrated soil fertility management as a cost effective approach to replenish soil fertility	Optimized fertilizer rates, Composts	Tanzania (Babati, Kongwa, and Kiteto districts), Malawi (Dedza and Ntcheu districts)
	Livestock manure	Tanzania (Babati, Kongwa, and Kiteto districts)
	Cover crop composts	Tanzania (Babati District)
Introduction of land management technologies to reduce soil loss and enhance water utilization	In-situ water harvesting	Tanzania (Babati, Kongwa, and Kiteto districts)
	Physical barriers to reduce erosion – “fanya juu”, “fanya chini”, and shelterbelts	Tanzania (Kongwa and Kiteto districts)
	Cover crops	Tanzania (Babati District) and Zambia (Chipata and Lundazi districts)
	Conservation agriculture	Zambia (Sinda, Chipata, and Lundazi districts)
Improved livestock feed quality and quantity	Quality forage and fodder based feed rations	Tanzania (Babati, Kongwa, and Kiteto districts) and Malawi (Dedza District)
	Poultry feeds with vegetable rations	Tanzania (Babati, Kongwa, and Kiteto districts)
	Livestock feed with fodder rations	Malawi (Dedza District)
Pre- and postharvest approaches to reduce food waste and improve food safety	Motorized shelling machine, collapsible dryer cases, PICS bags	Tanzania (Babati District)
	Aflasafe application in maize and groundnut fields	Tanzania (Babati District) and Zambia (Kazungula, Sesheke, Serenje, and Chipata districts)
Nutrient-rich food crops for improved household nutrition	Vegetables	Tanzania (Babati District)
	Quality protein maize	Tanzania (Kongwa and Kiteto districts), Zambia (Chipata District).
	Orange-fleshed sweet potato	Zambia (Lundazi, Chipata, Katete, and Sinda districts)

Partners

Tanzania

Tanzania agricultural research institutes at Selian, Naliendele, Hombolo, and Dakawa, International Center for Tropical Agriculture (CIAT), District Agriculture, Irrigation and Cooperative Offices Tanzania, International Crops Research Institute for the Semi-arid Tropics (ICRISAT), International Food Policy Research Institute (IFPRI), International Institute of Tropical Agriculture (IITA), International Livestock Research Institute (ILRI), Ministry of Agriculture, Food and Cooperatives Tanzania (MAFC), Cereals Market System Development (NAFAKA II), Sokoine University of Agriculture (SUA), Tanzania Livestock Research Institute (TALIRI), University of Dodoma, University of Zambia, Wageningen University and Research Centre (WUR), World Agroforestry Centre (ICRAF), World Vegetable Center (WorldVeg), and HORTI Tengeru.

Malawi

Agricultural Commodity Exchange (ACE), Agriculture Development Division (ADD), Catholic Development Commission in Malawi (CADECOM), International Center for Tropical Agriculture (CIAT), Catholic Relief Service (CRS), District Agriculture and Livestock Development

Offices Malawi, Farmers' Union of Malawi (FUM), International Food Policy Research Institute (IFPRI), International Institute of Tropical Agriculture (IITA), Lilongwe University of Agriculture and Natural Resources (LUANAR), Michigan State University (MSU), Malawi Improved Seed Systems and Technologies Program (MISST), Soils, Food and Healthy Communities, Malawi (SFHC), We Effect (WE), Wageningen University and Research Centre (WUR), and World Agroforestry Centre (ICRAF).

Zambia

International Maize and Wheat Improvement Center (CIMMYT), International Potato Center (CIP), Community Market for Conservation (COMACO), District Agriculture Coordinator Offices Zambia, Golden Valley Agricultural Research Trust (GART), International Institute of Tropical Agriculture (IITA), Production Finance and Improved Technology Plus (PROFIT+), Seed Certification and Control Institute (SCCI), Total Land Care Zambia, and Zambian Agriculture Research Institute (ZARI).

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